ENGLISH | TIẾNG VIỆT (mặt sau)

SHARP

FRACTION/SCIENTIFIC CALCULATOR

MODEL **EL-503W**

OPERATION MANUAL

INTRODUCTION

Thank you for purchasing the SHARP Fraction/Scientific Calculator Model EL-503W. This calculator will help you understand mathematical concepts behind fraction calculation, such as simplification and reduction.
After reading this manual, store it in a convenient location for future reference.

Operational Notes

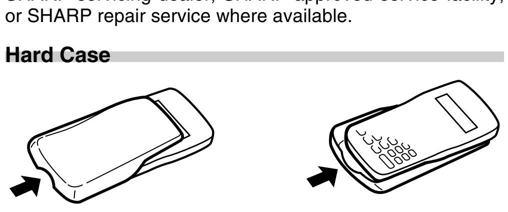
- Do not carry the calculator around in your back pocket, as it may break when you sit down. The display is made of glass and is particularly fragile.
- Keep the calculator away from extreme heat such as on a car dashboard or near a heater, and avoid exposing it to excessively humid or dusty environments.
- Since this product is not waterproof, do not use it or store it where fluids, for example water, can splash onto it. Raindrops, water spray, juice, coffee, steam, perspiration, etc., will also cause malfunction.
- Clean with a soft, dry cloth. Do not use solvents or wet cloth.
- Do not drop it or apply excessive force.
- Never dispose of battery in a fire.
- Keep battery out of the reach of children.
- This product, including accessories, may change due to upgrading without prior notice.

SHARP will not be liable nor responsible for any incidental or consequential economic or property damage caused by misuse and/or malfunctions of this product and its peripherals, unless such liability is acknowledged by law.

♦ Press the RESET switch (on the back), with the tip of a ball-point pen or similar object, only in the following cases. Do not use an object with a breakable or sharp tip. Note that pressing the RESET switch erases all data stored in memory.
- When using for the first time
- After replacing the battery
- To clear all memory contents
- When an abnormal condition occurs and all keys are inoperative.

If service should be required on this calculator, use only a SHARP servicing dealer, SHARP approved service facility, or SHARP repair service where available.

Hard Case



DISPLAY

- During actual use, not all symbols are displayed at the same time.
- Only the symbols required for the usage under instruction are shown in the display and calculation examples of this manual.

←/→ : Appears when the entire equation cannot be displayed. Press [◀]/[▶] to see the remaining (hidden) section.

2ndF : Appears when [2ndF] is pressed, indicating that the functions shown in orange are enabled.

x/y : Appears when x or y solutions are displayed in the equation mode.

SIMP : Indicates that a fraction can be simplified further, or entering a common denominator.

DEG/RAD/GRAD: Indicates angular units (Degrees, Radians and Grads) and changes each time [DRG] is pressed.

EQN : Appears when equation mode is selected.

STAT : Appears when statistical mode is selected.

M : Indicates that a numerical value is stored in the independent memory.

BEFORE USING THE CALCULATOR

Key Notation Used in this Manual

In this manual, key operations are described as follows:

To specify π : [2ndF] [π]
To specify Exp : [Exp]

To access functions printed in orange above keys, press [2ndF] first.
In this manual, number entry examples are shown with ordinary numbers (i.e., "100" will be indicated instead of "[1] [0] [0]").

Power On and Off

Press [ON/C] to turn the calculator on, and [2ndF] [OFF] to turn it off.

Clearing Methods

Operation	Entry (Display)	M*1	STAT, ANS*2	EQN (Coefficients)
[ON/C]	○	×	×	×
[2ndF] [CA]	○	×	○	○
Mode selection	○	×	○	○
RESET switch	○	○	○	○

○ : Clear × : Retain
*1 Independent memory M.
*2 Statistical data and last answer memory.

- To clear the independent memory (M), press [ON/C] [STO].

Editing the Equation

- Press [◀] or [▶] to move the cursor. To return to the equation after getting an answer, press [◀] ([▶]).
- To delete a number/function, move the cursor to the number/function you wish to delete, then press [DEL]. If the cursor is located at the right end of an equation, the [DEL] key will function as a back space key.
- To insert a number, move the cursor to the place immediately after where the number is to be inserted, then enter the number.

15 + 8	[ON/C] 15 [+] 8	***15+8_***
↓ 15 – 3	[DEL] [DEL]	***15_***
	[–] 3	***15–3_***
15 × 3 =	[ON/C] 15 [×] 3 [=]	***45.***
↓ 15 × 6 =	[◀]	***15×3_***
	[DEL] 6 [=]	***90.***
13 × 24 =	[ON/C] 13 [×] 24 [=]	***312.***
↓ 15 × 24 =	[▶]	***◀13×24***
	[▶] [DEL] 5 [=]	***360.***

Priority Levels in Calculation

This calculator performs operations according to the following priority:
① Functions expressed with numerical data placed before (such as x^{-1}, x^2, n!)
② y^x, $\sqrt[x]{y}$
③ Functions expressed with numerical data placed after (such as sin, cos, (–), e^x, 10^x, $\sqrt{\ }$)
④ Multiplications with the sign "×" omitted from the front of a function (such as 3cos20)
⑤ nCr, nPr, GCF, LCM
⑥ ×, ÷, INT÷, mod
⑦ +, –
⑧ Operations end commands (such as =, M+, %, ▶DEG, ▶RAD, ▶GRAD, DATA, CD)

- A parenthesized calculation section has precedence over other sections of the calculation.

INITIAL SETUP

Mode Selection

Normal Mode:
Used to perform arithmetic operations and function calculations. In this mode, **EQN** and **STAT** do not appear on the display.

Statistical Mode:
Used to perform statistical operations. To enter statistical mode, press [2ndF] [STAT]. **STAT** appears on the display to indicate that the statistical mode is selected. To return to normal mode, press [2ndF] [STAT] with **STAT** on the display. **STAT** disappears as the calculator returns to normal mode.

Equation Mode:
Used to solve equations. To enter equation mode, press [2ndF] [EQN] and then [0] or [1]. **EQN** appears on the display to indicate that the equation mode is selected. To return to normal mode, press [2ndF] [EQN] with **EQN** on the display. The calculator returns to normal mode and **EQN** disappears from the display.

- The mode will remain selected when the calculator is turned off.
- When executing mode selection, last answer memory will be cleared.

Scientific (Exponential) Notation

People who need to deal with very large and very small numbers often use a special format called exponential or scientific notation.

A number expressed in scientific notation has two parts. The first part consists of a regular decimal number between 1 and 10. The second part represents how large or small the number is in powers of 10.

While a calculation result is displayed in the floating point system, press [2ndF] [F↔E] to display the result in the scientific notation system. Pressing [2ndF] [F↔E] once again will bring back the floating point system.

To enter a number in scientific notation, press [Exp].

$(1.2 \times 10^{20}) \times (1.5 \times 10^5)$	1.2 [Exp] 20 [×] 1.5 [Exp] 5 [=]	***1.8×10²⁵***
3 ÷ 7 =		
[Floating point]	[ON/C] 3 [÷] 7 [=]	***0.428571428***
→ [Scientific notation]	[2ndF] [F↔E]	***4.285714286×10⁻⁰¹***
[TAB set to 2]	[2ndF] [TAB] 2	***4.29×10⁻⁰¹***
→ [Floating point]	[2ndF] [F↔E]	***0.428571428***

- Use [2ndF] [F↔E] to switch to the scientific notation, press [2ndF] [TAB], then give a value between 0 and 9 to set the decimal placement. To reset, press [2ndF] [TAB] 9.
- The number will be displayed in scientific notation if the floating point value does not fit in the following range: $0.000000001 \le |x| \le 9999999999$
- The last decimal digit in scientific notation will be rounded off.

Determination of the Angular Unit

In this calculator, the following three angular units (degrees, radians, and grads) can be specified.

→ **DEG** (°) → Press [DRG] → **RAD** (rad) → **GRAD** (g) →

SCIENTIFIC CALCULATIONS

- Select the normal mode.
- In each example, press [ON/C] to clear the display before performing the calculation.

Arithmetic Operations

12+16×3=	[ON/C] 12 [+] 16 [×] 3 [=]	***60.***
350–120÷4=	350 [–] 120 [÷] 4 [=]	***320.***
72×(–12)–150=	72 [×] [(–)] 12 [–] 150 [=]	***–1'014.***
(5+21)×(30–16)=	[(] 5 [+] 21 [)] [×]	
	[(] 30 [–] 16 [=]*1	***364.***
$(6\times10^3)\div(2\times10^{-4})$=	6 [Exp] 3 [÷]	
	2 [Exp] [(–)] 4 [=]	***30'000'000.***

*1 The closing parenthesis [)] just before [=] or [M+] may be omitted.

Constant Calculations

- In constant calculations, the addend becomes a constant. Subtraction and division are performed in the same manner. For multiplication, the multiplicand becomes a constant.
- In constant calculations, constants will be displayed as K.

245+60=	[ON/C] 245 [+] 60 [=]	***305.***
12+60=	12 [=]	***72.***
15×3=	15 [×] 3 [=]	***45.***
15×10=	10 [=]	***150.***

Functions

- For each example, press [ON/C] to clear the display.
- Before starting calculations, specify the angular unit.
- The results of inverse trigonometric functions are displayed within the following range:

	$\theta = \sin^{-1} x$, $\theta = \tan^{-1} x$	$\theta = \cos^{-1} x$
DEG	$-90 \le \theta \le 90$	$0 \le \theta \le 180$
RAD	$-\frac{\pi}{2} \le \theta \le \frac{\pi}{2}$	$0 \le \theta \le \pi$
GRAD	$-100 \le \theta \le 100$	$0 \le \theta \le 200$

sin60[°]=	[ON/C] [sin] 60 [=]	***0.866025403***
$\cos\frac{\pi}{4}$[rad]=	[DRG] [cos] [(] [2ndF] [π] [÷] 4 [)] [=]	***0.707106781***
$\tan^{-1}1$=[g]	[DRG] [2ndF] [tan⁻¹] 1 [=] [DRG]	***50.***
ln 20 =	[2ndF] [ln] 20 [=]	***2.995732274***
log 50 =	[2ndF] [log] 50 [=]	***1.698970004***
e^3 =	[2ndF] [e^x] 3 [=]	***20.08553692***
$10^{1.7}$ =	[2ndF] [10^x] 1.7 [=]	***50.11872336***
$3^2 + 5^2$ =	3 [2ndF] [x^2] [+] 5 [2ndF] [x^2] [=]	***34.***
$\sqrt{32} + \sqrt[3]{21}$ =	[√] 32 [+] 3 [2ndF] [$\sqrt[x]{\ }$] 21 [=]	***8.415778426***
7^4 =	7 [2ndF] [y^x] 4 [=]	***2'401.***
4! =	4 [2ndF] [n!] [=]	***24.***
${}_{10}P_3$ =	10 [2ndF] [nPr] 3 [=]	***720.***
${}_5C_2$ =	5 [2ndF] [nCr] 2 [=]	***10.***
$\frac{\pi}{3}$ =	[2ndF] [π] [÷] 3 [=]	***1.047197551***
$\frac{1}{4} + \frac{1}{5}$ =	4 [2ndF] [x^{-1}] [+] 5 [2ndF] [x^{-1}] [=]	***0.45***
200 × 32% =	200 [×] 32 [2ndF] [%]	***64.***
150 ÷ 300 = ?%	150 [÷] 300 [2ndF] [%]	***50.***
200 + (200 × 32%) =	200 [+] 32 [2ndF] [%]	***264.***
300 – (300 × 25%) =	300 [–] 25 [2ndF] [%]	***225.***

Random Numbers

A pseudo-random number with three significant digits can be generated by pressing [2ndF] [RANDOM] [=]. To generate the next random number, press [=].

Angular Unit Conversions

Each time [2ndF] [DRG▶] are pressed, the angular unit changes in sequence.

90°→ [rad]	[ON/C] 90 [2ndF] [DRG▶]	***1.570796327***
→ [g]	[2ndF] [DRG▶]	***100.***
→ [°]	[2ndF] [DRG▶]	***90.***
$\sin^{-1}0.8$ = [°]	[2ndF] [sin⁻¹] 0.8 [=]	***53.13010235***
→ [rad]	[2ndF] [DRG▶]	***0.927295218***
→ [g]	[2ndF] [DRG▶]	***59.03344706***
→ [°]	[2ndF] [DRG▶]	***53.13010235***

Memory Calculations

Mode	M	ANS
Normal	○	○
Statistical (STAT)	×	○
Equation (EQN)	○*1	×

○ : Available × : Unavailable
*1 only available for memory recall

This calculator has two memory allocations: independent memory (M), and last answer memory (ANS). You will find them especially useful when combinations of calculations become complicated, or when using the answer of previous calculation to another operations.

Press [ON/C] [STO] to clear the independent memory ("M" symbol will disappear).

[Independent memory (M)]

[STO] : Stores the result in the memory.
[RCL] : Recalls the value stored in the memory using up to 14 digits in accuracy.
[2ndF] [M+] : Adds the result to the value in the memory.

	[ON/C] 3 [×] 5 [STO]	***15.*** M
30 + (3 × 5) =	30 [+] [RCL] [=]	***45.*** M
(3 × 5) × 4 =	[RCL] [×] 4 [=]	***60.*** M
20+10–5=	[ON/C] 20 [+] 10 [–] 5 [STO]	***25.*** M
121+13×2=	121 [+] 13 [×] 2 [2ndF] [M+]	***147.*** M
+) 21×3–16=	21 [×] 3 [–] 16 [2ndF] [M+]	***47.*** M
(Total)	[RCL]	***219.*** M
	[ON/C] [STO]	***0.***

[Last answer memory (ANS)]

When [=] is pressed, the calculation result will automatically be stored in the last answer memory.

[2ndF] [ANS] : Recalls the value stored in last answer memory.

4 ÷ 5 = 0.8…(A)	[ON/C] 4 [÷] 5 [=]	***0.8***
4 × (A) + 60 ÷ (A) =	4 [×] [2ndF] [ANS] [+] 60 [÷] [2ndF] [ANS] [=]	***78.2***

Chain Calculations

- The previous calculation result can be used in the subsequent calculation. However, it cannot be recalled after entering multiple instructions.

6+4 = ANS	[ON/C] 6 [+] 4 [=]	***10.***
ANS + 5 =	[+] 5 [=]	***15.***
8 × 2 = ANS	8 [×] 2 [=]	***16.***
ANS² =	[2ndF] [x^2] [=]	***256.***

Calculating the Greatest Common Factor (G.C.F.) or Least Common Multiple (L.C.M.)

To calculate the G.C.F. or the L.C.M., the procedures are as follows:

What is the G.C.F. of 24 and 36?	[ON/C] 24 [G.C.F.] 36	***24GCF36_***
	[=]	***12.***
What is the L.C.M. of 15 and 9?	[ON/C] 15 [L.C.M.] 9	***15LCM9_***
	[=]	***45.***

Calculating Quotient and Remainder

[INT÷] : Calculates the quotient and remainder.

23 ÷ 5 =	[ON/C] 23 [INT÷] 5	***23▪5_***
(R: Remainder)	[=]	***4. R3.***
9.5 ÷ 4 =	9.5 [INT÷] 4	***9.5▪4_***
	[=]	***2. R1.5***
–32 ÷ (–5) =	[(–)] 32 [INT÷] [(–)] 5	***–32▪–5_***
	[=]	***6. R–2.***

- [INT÷] operation cannot be followed by another operation such as (+, –, ×, ÷), otherwise an error will result.
- The calculator can display a quotient or remainder up to 5 digits in length, including the "–" sign. If a quotient or remainder exceeds 5 digits, normal division is performed.

Calculating Remainder (Modulo Operation)

[mod] : Find the remainder when a numerical value is divided by a divisor.

What is the remainder of "5 ÷ 3"?	[ON/C] 5 [mod] 3	***5mod3_***
	[=]	***2.***
What is the remainder of "100 ÷ 8"?	[ON/C] 100 [mod] 8	***100mod8_***
	[=]	***4.***

FRACTION CALCULATIONS

Entering Fractions

- To enter fractions, use the following keys:

[x/y] : Places the symbol "⁄" between the numerator and the denominator.
[UNIT] : Separates the integer (whole number) part from the fractional part of a mixed number.

$\frac{2}{3}$ =	[ON/C] 2 [x/y] 3 [=]	***2/3***
$4\frac{1}{2}$ =	4 [UNIT] 1 [x/y] 2 [=]	***4⌴1/2***

- Up to 10 key strokes, including "⌴" and "⁄", can be used to enter a fraction.

Calculating with Fractions

Fractions can be incorporated into an arithmetic calculation.

The "**SIMP**" symbol will appear with a calculation result if the answer can be further simplified. Refer to the following section of this manual for details.

$\frac{1}{2} + \frac{1}{3}$ =	[ON/C] 1 [x/y] 2 [+] 1 [x/y] 3 [=]	***5/6***
$\frac{2}{5} \times \frac{1}{3}$ =	2 [x/y] 5 [×] 1 [x/y] 3 [=]	***2/15***
$(\frac{7}{5})^5$ =	7 [x/y] 5 [2ndF] [y^x] 5 [=]	***16807/3125***
$\sqrt{\frac{64}{225}}$ =	[√] 64 [x/y] 225 [=]	***8/15***

How to Simplify a Fraction

[Reducing to its simplest form]

If the result of pressing [=] is displayed with the "**SIMP**" symbol, the calculation can be reduced further. Use the [SIMP] key to set the factor of the fraction to simplify, either automatically or manually.

Automatic Simplification

$\frac{1}{3} + \frac{2}{12}$ =	[ON/C] 1 [x/y] 3 [+] 2 [x/y] 12 [=]	SIMP	***6/12***
	[SIMP]	SIMP	FACTOR?
	[=]*	SIMP	***6_***
	[=]		***1/2***

* If you do not know a common factor, press [=]. The greatest common factor "6" will be displayed.

Manual Simplification

$\frac{1}{3} + \frac{2}{12}$ =	[ON/C] 1 [x/y] 3 [+] 2 [x/y] 12 [=]	SIMP	***6/12***
	[SIMP]	SIMP	FACTOR?
	2 [=]*	SIMP	***3/6***
	[SIMP] 3 [=]		***1/2***

* "2" is entered as a factor, and the "**SIMP**" will be displayed to indicate further simplification of the fraction.
If the entered value is not a common factor, the cursor will be set under the value. Press [DEL] to clear the value, then enter a correct common factor. Press [ON/C] to return to the "FACTOR?" display.

Now that you have learned how to reduce a fraction to its simplest form, you can start using your calculator to perform fraction calculations quickly and efficiently.

$\frac{5}{6} + \frac{1}{14}$ =	[ON/C] 5 [x/y] 6 [+] 1 [x/y] 14 [=]	SIMP	***38/42***
	[=]*		***19/21***

* If [=] is pressed instead of [SIMP], the number will automatically be reduced down to its simplest form with the greatest common factor.

[Reducing to a common denominator]

Prior to pressing the [=] key, a common denominator can be set to organize calculations.

$\frac{1}{3} + \frac{1}{4}$ =	[ON/C] 1 [x/y] 3 [+] 1 [x/y] 4		***1/3+1/4_***
	[SIMP]	SIMP	DENOM.?
	48 [=]*		***16/48+12/48_***
	[=]	SIMP	***28/48***

* Enter a common denominator of the two fractions.
If the entered value is not a common denominator, the cursor will be set under the value. Press [DEL] to clear the value, then enter a correct common denominator. Press [ON/C] to return to the "DENOM.?" display.

$\frac{1}{3} + \frac{1}{4}$ =	[ON/C] 1 [x/y] 3 [+] 1 [x/y] 4		***1/3+1/4_***
	[SIMP]	SIMP	DENOM.?
	[=]*	SIMP	***12_***
	[=]		***4/12+3/12_***
	[=]		***7/12***

* If [=] is pressed instead of a number entry, the least common denominator will automatically be displayed.

Conversion from/to a Fraction

[A b/c] : Converts a decimal or improper fraction to a mixed fraction. In some cases, a decimal may not be converted to a fraction.
[A/B] : Converts a mixed fraction or decimal to an improper fraction. In some cases, a decimal may not be converted to a fraction.
[A.xxx] : Converts an improper fraction or a mixed fraction to a decimal.

$4\frac{5}{6}$ =	[ON/C] 4 [UNIT] 5 [x/y] 6 [=]		***4⌴5/6***
→ [A.xxx]	[A.xxx]		***4.833333333***
→ [A/B]	[A/B]		***29/6***
1 ÷ 3 =	1 [÷] 3 [=]		***0.333333333***
→ [A/B]	[A/B]		***1/3***
6 ÷ 5 =	6 [÷] 5 [=]		***1.2***
→ [A/B]	[A/B]	SIMP	***12/10***
→ [A b/c]	[A b/c]	SIMP	***1⌴2/10***
→ [A.xxx]	[A.xxx]		***1.2***
$1.25 + \frac{2}{5}$ =	1.25 [+] 2 [x/y] 5 [=]		***1.65***
→ [A b/c]	[A b/c]	SIMP	***1⌴65/100***
	[SIMP] [=] [=]		***1⌴13/20***

STATISTICAL CALCULATIONS

To enter the statistical mode, press [2ndF] [STAT]. The following statistics can be obtained:

$\bar{x}$: Mean of samples (x)
sx : Standard deviation of samples (x)
σx : Population standard deviation of samples (x)
n : Number of samples
Σx : Sum of samples (x)
Σx^2 : Sum of the squares of samples (x)

Entering Data

Entered data are kept in memory until [2ndF] [CA] or [2ndF] [STAT] are pressed. Before entering new data, clear the memory contents.
To enter sample data, use the numeric keys and press [DATA] ([STO] key) after each value.
To enter data with its frequency, use the numeric keys to enter the value, then press [FRQ(,)] ([RCL] key), enter the frequency, then press [DATA].

Enter the data "7"	[2ndF] [STAT]		**STAT**
	[2ndF] [CA] 7		***7_***
	[DATA]	n =	***1.****
There are 13 students who scored 70 in the test, and 5 students who scored 50.	[2ndF] [CA] 70 [FRQ(,)] 13		***70, 13_***
	[DATA]	n =	***13.***
	50 [FRQ(,)] 5		***50, 5_***
	[DATA]	n =	***18.***

* The number of samples for the entered data will be displayed.
- If the digits of the sample values exceed 9, "n=" will not appear.
- Inputting a formula as a sample value with frequency is possible.

Example: *A* [×] *B* [FRQ(,)] *frequency* [DATA]

Correcting Entered Data

Correction prior to pressing [DATA]:
Delete incorrect data with [ON/C].

Correction immediately after pressing [DATA]:
Press [▶] to confirm the latest entry and press [2ndF] [CD] ([STO] key) to delete it.
If you want to delete any other data, enter the values again and press [2ndF] [CD] to delete them.

Calculating Statistical Quantities

Score	Number of Persons
30	5
40	3
50	10
60	12
70	13
80	9
90	7
100	3

[2ndF] [CA]		**STAT**
30 [FRQ(,)] 5 [DATA]	n =	***5.***
40 [FRQ(,)] 3 [DATA]	n =	***8.***
50 [FRQ(,)] 10 [DATA]	n =	***18.***
60 [FRQ(,)] 12 [DATA]	n =	***30.***
70 [FRQ(,)] 13 [DATA]	n =	***43.***
80 [FRQ(,)] 9 [DATA]	n =	***52.***
90 [FRQ(,)] 7 [DATA]	n =	***59.***
100 [FRQ(,)] 3 [DATA]	n =	***62.***
[2ndF] [$\bar{x}$]		***65.32258065***
[2ndF] [sx]		***18.52935128***
[2ndF] [σx]		***18.37931358***
[2ndF] [n]	n =	***62.***
[2ndF] [Σx]	Σx =	***4'050.***
[2ndF] [Σx^2]	Σx^2 =	***285'500.***

- If both the resulting digits and the function name (such as Σx=) cannot be contained in the display, only the resulting value will be displayed; the function name will not be displayed.

Statistical Calculation Formulas

$$\bar{x} = \frac{\Sigma x}{n} \qquad \sigma x = \sqrt{\frac{\Sigma x^2 - n\bar{x}^2}{n}}$$

$$sx = \sqrt{\frac{\Sigma x^2 - n\bar{x}^2}{n-1}} \qquad \Sigma x = x_1 + x_2 + \cdots + x_n \qquad \Sigma x^2 = x_1^2 + x_2^2 + \cdots + x_n^2$$

(n: number of samples)

In the statistical calculation formulas, an error will occur if:
- the absolute value of the intermediate result or calculation result is equal to or greater than 1×10^{100}.
- the denominator is zero.
- an attempt is made to take the square root of a negative number.

EQUATION SOLVERS

Simultaneous linear equations with two unknowns or quadratic equations may be solved using this function.

① [2ndF] [EQN] [0]: Simultaneous linear equation with two unknowns (VLE)

$$\begin{cases} a_1x + b_1y = c_1 \\ a_2x + b_2y = c_2 \end{cases}$$
Coefficients: $a_1, b_1, c_1, a_2, b_2, c_2$
Solutions: x, y

② [2ndF] [EQN] [1]: Quadratic equation (QUAD)

$ax^2 + bx + c = 0$ Coefficients: a, b, c
Solutions: x

- Press [ENT] after entering each coefficient (a_1, a, etc.). Coefficients can be entered using ordinary arithmetic operations and functions.
- The solution (result) will be displayed after entering all coefficients.
- In the input/display screen of coefficients and the display screen of the solution (result), press [ON/C] to return to the previous coefficient.
- To clear all the entered coefficients, press [2ndF] [CA].
- The results obtained using this function may include a margin of error.
- The solution of a quadratic equation is only a real number.

	[2ndF] [EQN] [0]		**EQN**
$\begin{cases} 2x + 3y = 4 \\ 5x + 6y = 7 \end{cases}$	2 [ENT] 3 [ENT] 4 [ENT]		
	5 [ENT] 6 [ENT] 7		
x = ?	[ENT]	x	***–1.***
y = ?	[ENT]	y	***2.***
⇓	[ENT]		
$\begin{cases} 2x + 3y = 4 \\ 6x + 7y = 10 \end{cases}$	[ENT] [ENT] [ENT] [ENT] [ENT]		
	6 [ENT] 7 [ENT] 10		
x = ?	[ENT]	x	***0.5***
y = ?	[ENT]	y	***1.***
	[2ndF] [EQN]		
	[2ndF] [EQN] [1]		**EQN**
$3x^2 + 4x - 95 = 0$	3 [ENT] 4 [ENT] [(–)] 95		
first x value?	[ENT]	x	***5.***
second x value?	[ENT]	x	***–6.333333333***
⇓	[ENT]		
$6x^2 + 4x - 95 = 0$	6 [ENT] [ENT] [ENT] [ENT]		
first x value?	[ENT]	x	***3.659716184***
second x value?	[ENT]	x	***–4.32638285***

ERROR AND CALCULATION RANGES

Errors

An error will occur if an operation exceeds the calculation ranges, or if a mathematically illegal operation is attempted. If an error occurs, pressing [◀] (or [▶]) automatically moves the cursor back to the place in the equation where the error occurred. Edit the equation or press [ON/C] to clear the equation.

Error Codes and Error Types

Syntax error (Error 1):
- An attempt was made to perform an invalid operation.

Ex. 2 [+] [–] 5 [=]

Calculation error (Error 2):
- The absolute value of an intermediate or final calculation result equals or exceeds 10^{100}.
- An attempt was made to divide by 0 (or an intermediate calculation resulting in 0).
- The calculation ranges were exceeded while performing calculations.
- The solution of a quadratic equation is a complex number.

Depth error (Error 3):
- The available number of buffers was exceeded. (There are 10 buffers* for numeric values and 24 buffers for calculation instructions). * 5 buffers in STAT and EQN mode.

Equation too long (Error 4):
- The equation exceeded the maximum input buffer (159 characters). An equation must be shorter than 159 characters.

Calculation Ranges

- **Within the ranges specified below, this calculator is accurate to ±1 of the least significant digit of the mantissa. However, a calculation error increases in continuous calculations due to accumulation of each calculation error. (This is the same for y^x, $\sqrt[x]{\ }$, e^x, *n!*, *ln*, *mod*, etc. where continuous calculations are performed internally.)**

Furthermore, a calculation error will accumulate and become larger in the vicinity of inflection points and singular points of functions.

- Calculation range: $\pm10^{-99} \sim \pm9.999999999\times10^{99}$ and 0.

If the absolute value of an entry or a final or intermediate result of a calculation is less than 10^{-99}, the value is considered to be 0 in calculations and in the display.

Function	Dynamic Range
sin x cos x tan x	DEG : $\lvert x\rvert < 10^{10}$ (tan x : $\lvert x\rvert \ne 90(2n-1)$)* RAD : $\lvert x\rvert < \frac{\pi}{180} \times 10^{10}$ (tan x : $\lvert x\rvert \ne \frac{\pi}{2} \times (2n-1)$)* GRAD : $\lvert x\rvert < \frac{10}{9} \times 10^{10}$ (tan x : $\lvert x\rvert \ne 100(2n-1)$)*
$\sin^{-1}x$, $\cos^{-1}x$	$\lvert x\rvert \le 1$
$\tan^{-1}x$	$\lvert x\rvert < 10^{100}$
ln x, log x	$10^{-99} \le x < 10^{100}$
y^x	· $y > 0$: $-10^{100} < x\log y < 100$ · $y = 0$: $0 < x < 10^{100}$ · $y < 0$: $x = n$ ($0 < \lvert x\rvert < 1$: $\frac{1}{x} = 2n-1$, $x \ne 0$)*, $-10^{100} < x\log\lvert y\rvert < 100$
$\sqrt[x]{y}$	· $y > 0$: $-10^{100} < \frac{1}{x}\log y < 100$ ($x \ne 0$) · $y = 0$: $0 < x < 10^{100}$ · $y < 0$: $x = 2n-1$ ($0 < \lvert x\rvert < 1$: $\frac{1}{x} = n$, $x \ne 0$)*, $-10^{100} < \frac{1}{x}\log\lvert y\rvert < 100$
e^x	$-10^{100} < x \le 230.2585092$
10^x	$-10^{100} < x < 100$
x^2	$\lvert x\rvert < 10^{50}$
$\sqrt{x}$	$0 \le x < 10^{100}$
x^{-1}	$\lvert x\rvert < 10^{100}$ ($x \ne 0$)
n!	$0 \le n \le 69$*
nPr	$0 \le r \le n \le 9999999999$* $\frac{n!}{(n-r)!} < 10^{100}$
nCr	$0 \le r \le n \le 9999999999$* $0 \le r \le 69$ $\frac{n!}{(n-r)!} < 10^{100}$
nGCFn, nLCMn	$0 \le n < 10^{10}$
DRG▶	DEG→RAD, GRAD→DEG : $\lvert x\rvert < 10^{100}$ RAD→GRAD : $\lvert x\rvert < \frac{\pi}{2} \times 10^{98}$

* n, r: positive integers

BATTERY REPLACEMENT

Notes on Battery Replacement

Improper handling of battery can cause electrolyte leakage or explosion. Be sure to observe the following handling rules:
- Make sure the new battery is the correct type.
- When installing, orient the battery correctly as indicated in the calculator.
- The factory-installed battery may be exhausted before they reach the service life stated in the specifications.

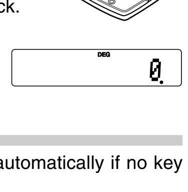
When to Replace the Battery

If the display has poor contrast or nothing appears on the display even when [ON/C] is pressed, it is time to replace the battery.

Caution

- Fluid from a leaking battery accidentally entering an eye could result in serious injury. Should this occur, wash with clean water and immediately consult a doctor.
- Should fluid from a leaking battery come into contact with your skin or clothes, immediately wash with clean water.
- If the product is not to be used for some time, to avoid damage to the unit from leaking battery, remove it and store in a safe place.
- Keep battery out of the reach of children.
- Exhausted battery left in the calculator may leak and damage the calculator.
- Explosion risk may be caused by incorrect handling.
- Do not throw battery into a fire as they may explode.

Replacement Procedure



1. Turn the power off by pressing [2ndF] [OFF].
2. Loosen both screws and remove the battery cover.
3. Replace the old battery with new, with the positive (+) sides facing up.
4. Replace the battery cover and screws.
5. Press the RESET switch on the back.

- Make sure that the display appears as shown. Otherwise, remove the battery, reinstall, and check the display again.

Automatic Power Off Function

This calculator will turn its power off automatically if no key is pressed for about 10 minutes.

SPECIFICATIONS

Calculations:	General arithmetic operations, statistical calculations, equation solvers, etc.
Calculation method:	D.A.L. (Direct Algebraic Logic)
Internal calculations:	Mantissas of up to 14 digits
Pending operations:	24 calculations 10 numeric values (5 numeric values in STAT and EQN mode)
Power source:	1.5V ⎓ (DC): Alkaline battery (LR44 or equivalent) × 1
Power consumption:	0.0001 W
Operating time:	Approx. 5,000 hours, when continuously displaying 55'555. at 25°C (77°F). May vary according to usage and other factors.
Operating temperature:	0°C – 40°C (32°F – 104°F)
External dimensions:	78.6 mm (W) × 144 mm (D) × 11.6 mm (H) 3-3/32" (W) × 5-21/32" (D) × 15/32" (H)
Weight:	Approx. 73 g (0.17 lb) (Including battery)
Accessories:	Battery × 1 (installed), operation manual, quick reference card and hard case.

FOR MORE INFORMATION

Visit us on the Internet at:
http://sharp-world.com/calculator/

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